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PATENT AND TECHNICAL TRANSLATION

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*GERMAN AND FRENCH TO ENGLISH
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DECLARATION

The undersigned, Olaf Bexhoeft, hereby states that he is well acquainted with both the English and German languages and that the attached is a true translation to the best of his knowledge and ability of the German text of PCT/EP2004/052525, filed 10/13/2004, and published on 04/21/2005 as WO 2005/035409 A1, and twenty (20) amended claims.

The undersigned further declares that the above statement is true; and further, that this statement was made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or document or any patent resulting therefrom.

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Specification

Device and Method for Distributing Flat Objects Using a Transport Section

The invention relates to a device and a method for delivering flat objects by means of a conveying track in accordance with the preamble of claim 1 or 25.

Such a delivery device is employed in particular at the outlet of a rotary printing press in order to deliver individual signatures from a continuous web of imprinted paper webs to a plurality of conveyor belts. A known delivery device of this type is described in DE 101 16 346 A1, for example. This known device employs conveying tracks in which a signature is conveyed clamped between endless belts, which are respectively looped around a plurality of rollers. For distributing the signatures to different delivery points, the conveying track is forked several times, and a signature shunt in the form of a wedge is located at the respective forks, which can be moved back and forth and, depending on the position, diverts a passing signature into different directions, and in this way conducts it to different branches of the conveying track. For distributing a flow with the aid of such a signature shunt over two different paths, the signature shunt must be able to change its position between respectively two passages of signatures. This is only possible if the signatures do not directly follow each other. If the signatures are cut from a continuous web, such a distance between signatures can only be achieved if the speed of the conveying track is clearly

greater than that of the web prior to cutting. The shorter the distance between two successive signatures at the level of the shunt is, the faster the latter must be able to switch. This leads to considerable demands made on the mechanical system of the signature shunt, which can only be met with considerable technical outlay and corresponding costs.

The object of the invention is based on creating a device and a method for delivering flat objects by means of a conveying track.

In accordance with the invention, this object is attained by means of the characteristics of claim 1 or 25.

The advantages which can be achieved by means of the invention lie in particular in that the device makes do without rapidly and discontinuously moved parts, such as for example the above described signature shunt. Furthermore, no large distances are required between objects following each other on the conveying track in order to transport them without problems to different delivery positions.

Paddle wheels are preferably arranged on one side and/or below the conveying track, so that the objects conveyed on the conveying track tend to push into a compartment of the paddle wheel because of their inherent weight, if that is possible.

A tip of each paddle crossing the conveying track while the compartment formed by the paddle adjoins the conveying track is used to catch the front end of an object which is located on the conveying track at the level of the compartment of a paddle, and to guide it into the compartment. To this end it is also preferred for the

circumferential speed of the paddle to be less than the conveying speed of the conveying track.

It is sufficient for the device if each paddle wheel has only a single paddle. It is also possible to provide two paddles per paddle wheel, since this simplifies the balancing of the paddle wheels and, in comparison with the case with a single paddle, makes no noticeable increase of the circumference of the paddle wheel necessary.

Adjacent paddle wheels preferably have a mutual phase shift of 2 pi(d/vT±1/mN), wherein d is the distance between the paddle wheels, N the number of paddle wheels, m the number of their paddles, v the conveying speed of the conveying track and T the time interval between two objects conveyed on the conveying track. This phase difference assures that two objects successively conveyed on the conveying device are taken over by the n paddle wheels in a cyclically alternating manner.

Preferably the number N of the paddle wheels is four. If the device is employed in connection with a printing press whose plate cylinder can take on four plates or print images in the circumferential direction, the device with four paddle wheels allows it to deliver printed products, which were respectively printed by the same printing plates or have the same print images, at the same location, and in this way to sort the printed products following each other cyclically on the conveying track.

If the device is used for printed products, a transverse cutting device is preferably placed upstream of it, which cuts an imprinted web of material or a continuous strand of webs of material into individual printed products.

Preferably a vertical section of the conveying track is arranged following the transverse cutting device, which can be used to space the individual printed products delivered by the transverse cutting device apart from each other on the conveying track. But the paddle wheels are preferably arranged at a horizontal section of the conveying track in order to make the delivery of the products into the compartments of the paddle wheels simpler.

Exemplary embodiments of the invention are represented in the drawings and will be described in greater detail in what follows.

Shown are in:

Fig. 1, a schematic sectional view through the device,

Fig. 2, an enlarged detail of the device,

Fig. 3, a modification of the paddle wheel of the device.

An inlet of the device represented in Fig. 1 is constituted by a transverse cutting device 01, for example a cutting cylinder pair 01. As illustrated by an arrow, a strand of imprinted webs of material, for example paper webs, is fed from above out of a superstructure (not represented) to the cutting cylinder pair 01. One cylinder of the cutting cylinder pair 01 has a cutter which, cooperating with a countersupport of the other cylinder of the cutting cylinder pair 01, cuts a section of the size of a page off from the strand at every revolution of the cutting cylinder pair 01. The object obtained in this manner, in particular the printed product, enters an inlet nip 02 of a conveying track 03, which is constituted by endless belts 06, for example transport belts 06, circulating over a plurality of rollers

04. The circulating speed of the endless belt 06 is greater by approximately 5% than the speed of the paper webs fed to the cutting cylinder pair 01. Thus the individual products are gradually accelerated in the inlet nip 06 of the conveying track 03, which gradually tapers in the downward direction, from which a gap of approximately 5% of their lateral length results between successive printing products.

The initially vertically extending conveying track 03 makes a transition into a horizontal orientation at a roller 07 of large diameter. The function of the roller 07 can be solely the deflection of the conveying track 03, but it could also be a collecting cylinder 07, known per se, on which each printed product makes at least one complete revolution in a manner known per se, is combined with at least one other printed product to form a stack, and is finally passed on as a stack for further conveyance.

The roller 07 can also be embodied as a folding blade cylinder 07.

The printed products delivered from the roller 07 move on over a horizontal section of the conveying track 03, along which a number N of paddle wheels 08, here four, each with only a single paddle, are arranged one behind the other. The paddle wheels 08 are arranged at an even distance d from each other and rotate at the same speed, wherein a phase shift of respectively 2 pi(d/vT±1/N) exists between adjoining paddle wheels 08, wherein v indicates the speed of the endless belts of the conveying track 03 and T the time interval between two successive printed products on the conveying track 03. A section of the conveying track 03 is respectively arranged between two paddle wheels 08. This selection of the phase

difference between the paddle wheels 08 assures that each time a printed product is located above a paddle wheel 08, either the compartment 11 of this paddle wheel 08 faces it, so that the printed product can enter into the compartment 11, or the compartment 11 is offset by ± 1/4 or 1/2 of a revolution, and that (depending on the mathematical sign) successively conveyed products are taken in one after the other by the compartment 11 of the first, second, third, fourth, and then again the first paddle wheel 08, or are taken in in the reverse order.

The paddle wheels 08 are put together from a plurality of substantially circular disks, which can be rotated on one level around common axes of rotation, and into each of which a compartment 11 has been cut and which rotate as a circumferential speed which is slightly less than the rotational speed of the endless belts 06 and is preferably identical to the speed of the paper webs fed to the cutting cylinder pair 01. Only the free end of each paddle 09 protrudes some distance past the circumference of the circular disk, so that in its position in which it faces the conveying track 03, this free tip 12 crosses the latter (see Fig. 2).

As can be seen in Fig. 2, the tip 12 slightly deflects the trailing end of the printed product 13 upward, while at the same time it constitutes an obstacle for the leading edge of a following printed product 14, because it moves slower than the latter, and deflects the leading edge of the printed product 14 downward into the compartment 11. It becomes immediately clear that no large distance between successive printed products is required for snatching the printed

product 14 out of the conveying track 03 into the compartment 11. Instead, it is quite desirable to have a rather short spacing between the printed products, so that the printed product 14 is pushed as deeply as possible into the compartment 11 before its trailing end loses contact with the endless belts 06 of the conveying track 03.

Tines 16 of a stationary rake extend from below between the disks of each paddle wheel 08 in order to push a printed product possibly contained in the compartment 11 of the paddle wheel 08 out of the compartment 11 in the course of the rotation of the paddle wheel 08 in a clockwise direction, and to deposit it at a deposit location 17, here a conveyor belt 17 moving transversely in relation to the plane of Fig. 2.

Even though only four paddle wheels 08 are represented in Fig. 1, it is obvious that the principle of the invention can be generalized to contain any arbitrary number of paddle wheels 08 and deposit locations. The number N of the paddle wheels 08 is a whole number and can be larger than or equal to three. However, it is generally not very useful to have more deposit locations 17 than different printing products can be present on the conveying track 03. This means that when the device is used in connection with a printing press whose plate cylinders can support up to four different plates or print images in the circumferential direction, no more than four deposit location 17 corresponding to these four plates or printed images are useful.

If, as mentioned above, the roller 07 is a collecting cylinder 07, which is operated in a collecting mode and releases printed products combined from respectively two

stacked sections, this leads, in contrast to the non-collecting mode, to doubling of the period T at which the printed products pass the paddle wheels 08. The collected printed products are now deposited at only two of the four deposit locations without a change in the movement of the individual paddle wheels 08 being required.

If there is no operation in the collection mode, but it is still intended to deposit on only two of the four provided deposit locations 17, or conveyor belts 17, this is easily possible with the modification of the paddle wheel 08 represented in Fig. 3. This modified paddle wheel 08 has two paddles 09 at positions which are diametrically opposite each other, and the tip of at least one of the paddles 09 can be pivoted between the position represented in Fig. 2, in which it projects past the circumference of the circular plate of the paddle wheel 08, and a lowered position in which it, as represented at the bottom of Fig. 3, does not project past the circumference and instead closes off the compartment 11 in which it is arranged. If for example such a paddle wheel 08 is mounted in the position next adjoining the roller 07 in Fig. 1 it acts, as long as the second tip 12 is lowered, no different from a paddle wheel 08 with a single paddle 09; however, when the tip 12 is pivoted out, this paddle wheel 08 catches every second printed product passing it. If the paddle wheel 08 of the type represented in Fig. 3 is also mounted in the second next position to the roller 07 in Fig. 1, it is possible to make deposits selectively on two, three or four conveyor belts 17.

It is also conceivable to provide a paddle wheel (not represented) at the first position, which has four paddles at

respective distances of 90°, at least three of which have pivotable tips. If all of these tips are pivoted out, such a paddle wheel catches all printed products passing on the conveying track 03 and deposits them on its conveying belt 17.

The device picks up identical objects in the first paddle wheel 08, and identical second objects differing from the first objects in the second paddle wheel 08, in the third paddle wheel 08 identical third objects, and in the fourth paddle wheel 08 identical fourth objects differing from the third objects.

Preferably, each paddle wheel 08 has fewer than five paddles 09, in particular fewer than three paddles 09.

The flat objects are transported by means of the conveying track 03 and paddle wheels 08. In the process, the objects are transported one behind the other along the conveying track 03. One of these objects is taken out of the conveying track 03 and transported into a compartment 11 of a first paddle wheel 08. The remaining objects are transported along the conveying track 03 to a paddle wheel 08 located downstream of the first paddle wheel 08 in relation to the transport direction of the conveying track 03 and one of these objects is taken from the conveying track 03 and transported into a compartment 11 of the second paddle wheel 08.

Thereafter, the remaining objects are transported along the conveying track 03 to a third paddle wheel 08 located downstream of the second paddle wheel 08 in relation to the transport direction of the conveying track 03 and one of these objects is taken from the conveying track 03 and

transported into a compartment 11 of the third paddle wheel 08.

The remaining objects are transported along the conveying track 03 to a fourth paddle wheel 08 located downstream of the third paddle wheel 08 in relation to the transport direction of the conveying track 03 and one of these objects is taken from the conveying track 03 and transported into a compartment 11 of the fourth paddle wheel 08.

The number N can correspond to the number of the different objects arranged one behind the other on the conveying track 03.

List of Reference Numerals

01	Transverse cutting device, cutting cylinder pair
02	Inlet nip
03	Conveying track
04	Roller
05	-
06	Endless belt, conveyor belt
07	Roller, collecting cylinder, folding blade cylinder
08	Paddle wheel
09	Paddle
10	-
11	Compartment
12	Tip
13	Printer product
14	Printer product
15	-
16	Tine
17	Deposit location, conveyor belt